AN OBJECTIVE APPROACH TO THE DIAGNOSIS AND MANAGEMENT OF ABNORMAL LABOR*

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THE PROBLEM CONCERNING CRITERIA OF NORMALITY

BEFORE we can discuss intelligently the detection of aberrant patterns of labor and their management we must be able to characterize normal labor clearly. Clinical labor varies widely and the practitioner's skills are taxed to their utmost in this regard. Innumerable intricate nuances are involved. Many of our clinical concepts of labor and its abnormalities are rather, poorly founded; hence much of the discipline of obstetrical pathology is based on personal experience only. It is imperative that objectivity be introduced so that all physicians, experienced and inexperienced, may be well equipped to diagnose disorders of labor early and definitively.

In clinical practice we are often deluded into believing that any increase in the intensity, frequency, or duration of uterine contractions, or in cervical dilatation or descent of the fetal presenting part, regardless of the time involved, is adequate—until it has perhaps taken its toll in irreparable damage. It is true that nearly all labors progress normally. By the same token the few abnormal labors that require our most concentrated effort are almost always approached with major deficiencies in our understanding as to diagnosis and optimal management.

The usual diagnostic criteria in use nowadays invoke arbitrary standards of total duration of labor, beyond which abnormality may be considered to exist. These limits are unfortunate because many serious abnormalities may arise long before the normal duration has been exceeded, and many labors that extend well beyond the normal time

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may be perfectly normal. Thus, for example, labors lasting longer than 24 hours are usually deemed to be abnormal and, therefore, to warrant consultative evaluation. This practice gained general acceptance, not so much because the criterion of duration is diagnostic (which I hasten to insist it is not), but rather because there is a relation between prolonged labor and increased fetal morbidity and mortality. On this basis it is generally held that such cases of high-risk labor deserve close scrutiny. It is clear, however, that not all labors which exceed these uncritical limits subject the fetus to comparable risk. The single guideline of duration, therefore, must be considered as much too coarse and insufficiently definitive to permit us to specify precisely which patients are at risk by virtue of the presence of aberrant labor. Further, and probably more important, the physician who utilizes total duration as the diagnostic criterion of abnormal labor may too readily be overlooking serious disorders of labor that become manifest earlier.

The clinical data available to the obstetrician for interpretation include patterns of uterine contractility and progression of cervical dilatation and descent of the fetal presenting part. These parameters have been studied in detail and supported by physiological studies which require sophisticated instrumentation, such as external tokodynamometry, direct intrauterine cannulation for monitoring intra-amniotic fluid pressure, electrohysterography, and many others. While providing useful and accurate measures of continued activity, these approaches have not as yet offered means whereby normal labor can be distinguished from abnormal labor. They represent impractical tools for the study of a given labor, especially by obstetricians not endowed with the benefits of an academic research organization. Since they do not as yet provide the kind of information that will help make needed differential diagnoses, we must seek some other kind of simple, practical, and objective tool for the study of individual labors in progress.

A method of clinical study has been evolved that concerns itself with observing the way in which cervical dilatation and descent vary with elapsed time in labor.[1] By using this approach, we may simplify the relatively complex clinical art concerned with the dynamic nature of the changes that take place in labor. When properly programmed, determinations of cervical dilatation and station of the fetal presenting part can be of great value in the management of the parturient. Utilization of the singular relations between dilatation and time and between descent and time offers readily grasped concepts of the progression and aberrations of labor. This method not only has been found useful for the study of individual labors in progress, but its value has been determined also for investigation and teaching of the management of labor, and for the evaluation of the effects of various factors that may influence the course of labor.

One may simplistically consider the laboring patient as a complex machine. It is not necessary to understand the inner workings completely for us to be able to study such a machine in great detail, especially insofar as energy input, work output, and factors that affect both are concerned. The task demanded of the gravid patient consists of two components: cervical dilatation and fetal descent. The sources of energy for accomplishing these purposes are likewise made up of two aspects: namely, uterine contractions and expulsive efforts. A mechanistic concept can be evolved for the labor phenomenon that allows us to consider the interrelation between energy input and work output. This relation is well defined in physics, the ratio of one to the other being a measure of the efficiency of the mechanical device under study. The components of the efficiency equation for the laboring patient consist of the summation of contractility and expulsive forces counterbalanced by the composite resistance of maternal tissues to dilatation and descent. Whereas the driving forces are readily measurable in great detail by available physiological means, we have no substantive way to measure resistance accurately. Thus a direct measure of efficiency is not yet obtainable. However, an indirect approach is possible and, as we shall see, it can be utilized for the purpose of determining the presence or absence of labor aberrations.

Graphic Analysis of the Progress of Labor

Estimates of cervical dilatation and of station have long been used as guides in judging the progress of labor. Single estimates, however, must be understood to represent only momentary observations made within the framework of a constantly changing process. Taken alone these give rise to a static concept of labor. The inadequacy of the picture portrayed by such isolated observations is apparent, since they cannot provide an adequate overview of the entire process. Multiple observations, in contrast, may be correlated with elapsed time in labor to provide a means whereby labor may be followed objectively and

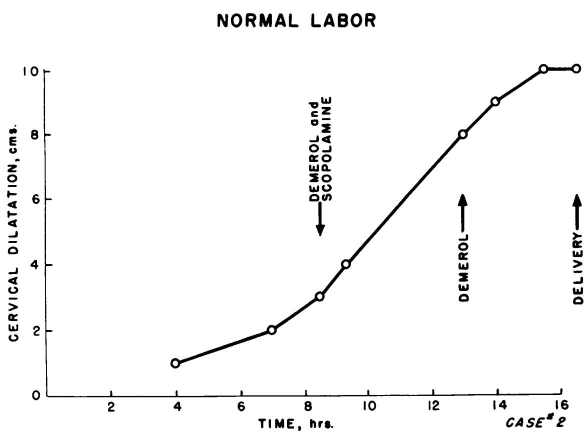

Fig. 1. Representative tracing of the course of cervical dilatation in the labor of a nulliparous patient. Estimates of cervical dilatation (vertical axis) have been plotted against elapsed time in labor (horizontal axis). The sigmoid curve is characteristic of all normal labors. Reproduced by permission from Friedman, E. A.: The graphic analysis of labor. *Amer. J. Obstet. Gynec. 68*:1568-575, 1954.

abnormalities may be detected as they arise. The critical aspect here is the correlation of these observations with progression of time in labor, affording us an appreciation of the dynamic aspects inherent in the phenomenon we wish to study. Whereas heretofore evaluation of progress in labor was synonymous with a fairly nebulous degree of change, we now have means whereby specific rates of change and the development of specific patterns of dilatation and descent can be made diagnostically meaningful. The inconsistencies in measurable aspects of contractility make them rather unreliable for evaluating labors in progress. The dilatation-time and descent-time functions, on the other hand, represent useful summations and ongoing measures of the complex process of labor.

When isolated observations of cervical dilatation in any particular labor are plotted against the time elapsed, using a vertical axis of cervical dilatation in centimeters and a horizontal axis of hours in labor, the characteristic sigmoid-shape curve is generated. This pattern is seen in all normal labors (Figure 1). A similarly characteristic hyperbolic curve is traced in all normal labors when station is plotted against time. These rather simple visual patterns allow for quick interpretation and evaluation of the labor in progress. Each patient constructs her own unique clinical picture, which offers a reliable means for following the course of the normal labor and for distinguishing it objectively from abnormal varieties. The characteristic normal patterns of dilatation and descent are common to all patients and are independent of the more variable and less reliable aspects of labor, including contractility patterns and soft-part resistance. They provide rather important indicators of changes in the quality of labor, the timing of delivery, and presence of abnormal factors. The method entails a technique for recording simple data that the physician would ordinarily gather in any event. Except for graph paper, it requires no special equipment and no specialized knowledge. Indeed, as has already been indicated, electronic techniques of measurement offer no significant advantage over the familiar digital estimates of dilatation and station. Inasmuch as the shape of the pattern is the chief evaluative factor, it will be seen that the inaccuracies of digital estimates are relatively unimportant, provided they are consistent. Easily communicable, the method is readily learned by the uninitiated and in their hands it rapidly becomes more reliable than the accumulated intuition and clinical impressions of some physicians who have many years of experience.

Any square-ruled graph will do for the construction of these patterns. Many hospitals prefer to devise their graphs so as to incorporate the record into the hospital chart. Horizontal coordinates are numbered by hours of labor. The onset of labor is defined arbitrarily as the onset of regular uterine contractions as perceived by the patient. The vertical coordinates on the left are numbered in ascending order to represent centimeters of cervical dilatation. At the right the same vertical coordinates are keyed in descending order with the familiar measurements which denote the station of descent in centimeters according to the level of the forward leading edge of the fetal bony prominence above (negative values) or below (positive values) the plane of the ischial spines. For convenience in identification, an estimate of cervical dilatation is entered by a small circle and that of station by an X. Each subsequent observation is joined to the preceding notation by a straight line. The resulting graph furnishes a simple visual pattern for quick assessment of labor in progress.

The characteristic patterns allow us to measure the durations of the various distinctive portions of the labor and to study the change in cervical dilatation and in descent per unit time. The slope of the curve is a very accurate measure of the specific rate of change for a given labor. Careful study has revealed that this slope, within limits of error, is specific for each patient, but that it undergoes predictable changes during the course of normal labor. Moreover, it is now clear that the slopes of the curve of active dilatation and of descent are measures of the efficiency of the complex machine to which I referred earlier. It is an acceptable concept to consider that the more steeply inclined the slopes of dilatation and descent, the more efficient is the machine in terms of the work generated as related to the utilization of energy; the less steeply inclined, the less efficient is the machine. Such relations may be considered to hold regardless of the existing pattern of contractility.

The physician is confronted by a wide range of normality in terms of patterns of contractility. At one extreme is the patient with negligible contractions; her cervix is dilating unobtrusively while we try to determine whether or not she is in labor. The rapid dilatation and descent that occur under these circumstances in the presence of minimal generation of labor forces bespeak a highly efficient unit. At the other extreme is the woman who suffers contractions of great intensity and frequency that may continue for many hours before cervical dilatation becomes apparent. Here a great deal of energy is being expended to overcome high resistance and ultimately to accomplish the same work. This represents an exceedingly inefficient laboring machine. Yet both are normal variants and the physician with enough experience will recognize their inherent differences.

Arbitrary subdivisions of the first stage of labor have permitted analytical study.[1] The first stage is readily divisible into two parts: the *latent phase*, extending from the onset of labor to a point in time when the curve begins to change sharply; and the *active phase*, which begins with the upswing of the curve and terminates at full dilatation and retraction of the cervix at the onset of the second stage. The active phase may be further subdivided into an initial acceleration phase, a linear phase of maximum slope, and a terminal deceleration phase. The latent phase is an interval during which orientation of uterine contractions takes place along with softening and effacement of the cervix in preparation for subsequent active dilatation. The phase of maximum slope is that interval during which cervical dilatation proceeds at its most rapid rate in a constant, linear manner. Its slope is clearly a measure of efficiency. The more steeply it is inclined, the more efficient the energy

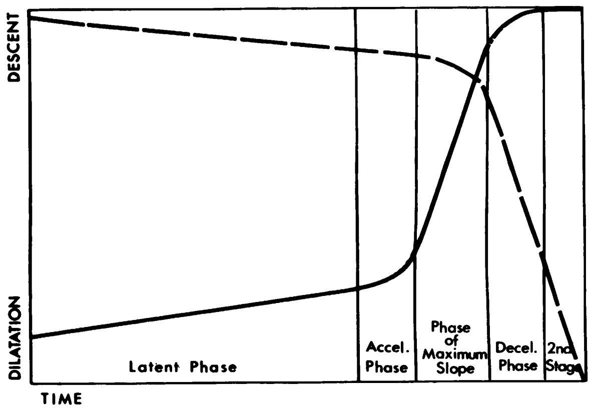

Fig. 2. Diagrammatic representation of cervical dilatation (solid line) and descent (broken line) patterns as they are traced against elapsed time in labor. The distinctive phases of the first stage are shown. The active phase comprises that interval from the onset of the acceleration phase to the conclusion of the deceleration phase at the beginning of the second stage. Maximum rate of descent is reached when the deceleration phase begins. Reproduced by permission from Friedman, E. A. and Sachtleben, M. R.: Station of the fetal presenting part. I. Pattern of descent. *Amer. J. Obstet. Gynec.* *93*:522-29, 1965.

input is in effecting work output, as I have indicated earlier. The deceleration phase merely represents the cephalad cervical retraction that occurs at the end of the first stage.

The corresponding descent curve retains its latent aspects until the dilatation curve has entered the phase of maximum slope, at which time descent usually begins its active phase. Descent reaches its maximum slope concurrently with the onset of the deceleration phase of dilatation. From this moment onward, descent continues in a linear manner until the presenting part reaches the perineum. The slope of descent here is another measure of the efficiency of the energy source in accomplishing its work. The component parts of the dilatation and descent curves are shown in Figure 2.

Functional Divisions of Labor

One may also subdivide labor into functional units based on these patterns (Figure 3). To do so represents a departure from the classic concept of labor in which the first stage is considered to be the stage of dilatation and the second stage of descent. Closer observation has shown that dilatation occupies only a small part of the first stage, while descent

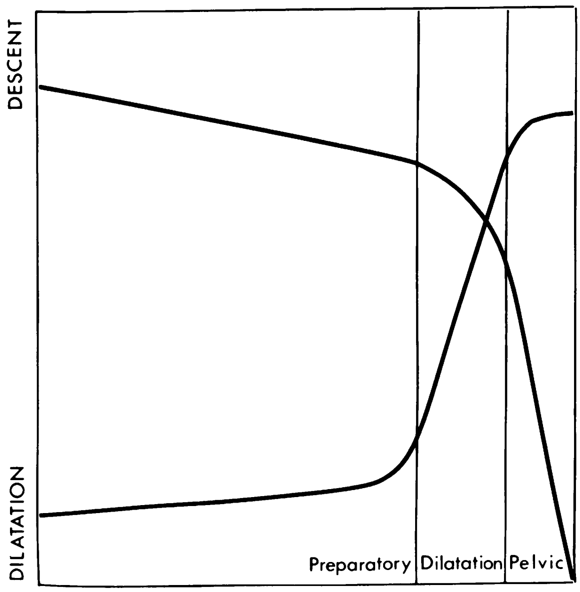

Fig. 3. The functional divisions of labor based on the interrelations between cervical dilatation and descent curves. Labor is readily divisible into its three functionally distinct components, including preparatory, dilatational, and pelvic segments in sequence. Reproduced by permission from Friedman, E. A.: The functional divisions of labor. *Amer. J. Obstet. Gynec. 109*:274-80, 1971.

overlaps both stages, beginning and progressing well before the first stage ends. Accordingly, we may consider labor to be divisible into three separate functional units.[2] These are important insofar as they represent distinctive intervals from physiologic, pathologic, therapeutic, and prognostic points of view. Each of these separate functional parts is easily recognizable, each is affected by different factors, each is responsive to various exogenous influences, and each is subject to its own disorders. The recognition and understanding of these differences, especially as they relate to the etiology, treatment, and prognosis of disorders associated with the separate functional divisions of labor, must be considered essential for the practitioner in this field. These divisions, termed preparatory, dilatational, and pelvic, are based on the aforementioned cervical dilatation-time and descent-time patterns.

The changes that take place during the preparatory division of labor are subtle. They include factors that relate to orientation and coordination of myometrial contractility as well as to softening and effacement of the cervix. Delayed evolution of effective contractility to overcome resistance of the soft parts will result in abnormal prolongation of the latent phase of the dilatation curve. This division is especially sensitive to sedation and anesthesia. The poorly polarized uterine contractions are readily disturbed because myometrial function has not become sufficiently coordinated to withstand inhibitory influences completely. Further, the labor that begins with the cervix poorly prepared for subsequent active dilatation will of necessity be characterized by a longer preparatory division.

The cervix undergoes active dilatation only during a relatively short part of the first stage. All dilatation, except that which has occurred prior to the onset of labor and the small additional amount that takes place during the preparatory division, occurs in the interval span of time that terminates the first stage. This is called the active phase. It is important to repeat that the inclination of the maximum slope of dilatation can be considered to represent a measure of the efficiency of a contractile pattern in overcoming resistance to dilatation. Disordered dilatation, especially where protracted and dilatory, may result from unfavorable combinations of myometrial dysfunction and excessive soft-part resistance.

The beginning of the pelvic division is marked by the onset of the deceleration of dilatation and the simultaneous attainment of maximum rate of descent. Ordinarily descent continues uninterruptedly from this time onward. The linear descent pattern constitutes another measure of the over-all efficiency of the labor process, analogous to that of the linear active dilatation curve. The inclination provides a meaningful measure of the effectiveness of the motive force in producing the work required of it: namely, descent of the fetus through the birth canal. Disorders of this functional division will result from factors that interfere with descent, such as fetopelvic disproportion, malpresentation, and disordered forces, including those secondary to exogenous factors or exhaustion.

Disorders of Labor

Graphic analysis has made possible the study of abnormal patterns of the progression of labor for the purposes of defining etiologic factors, stressing the diagnostic criteria, and determining the relative efficacy of treatment utilized for the major disorders that constitute dysfunctional

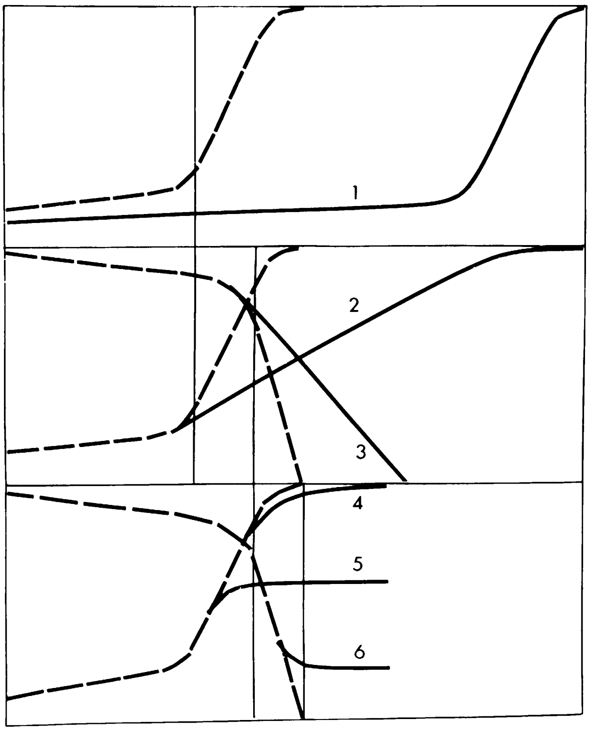

Fig. 4. The six graphic disorders of dilatation and descent grouped according to functional divisions of labor. Top: the normal dilatation curve is compared with prolonged latent phase, an abnormality of the preparatory divison. Middle: disorders of protraction of the dilatational division: namely, protracted active-phase dilatation and protracted descent. Bottom: arrest disorders of the pelvic division, including prolonged deceleration phase, secondary arrest of dilatation, and arrest of descent. The broken curves represent mean normal patterns, the unbroken portions, abnormal.

labor.[1] Quantitative limits for the various portions of the dilatation and descent curves have been determined. By constructing the relevant distribution curves for the duration of the latent phase, for example, we learned that 95% of all known nulliparas go through their latent phase in less than 20 hours. Similarly, a comparable number of multiparas have a latent phase less than 14 hours. The choice of the 95 percentile limit is based on our attempt to identify all abnormalities of labor, while not diluting our case finding excessively with normal examples. Although arbitrarily selected, the limits have been shown to be reasonably appropriate insofar as prognosis is concerned.

Similar limits define abnormally slow rates of dilatation in the active

DYSFUNCTIONAL PATTERNS OF LABOR

	Prolonged latent phase	*Protraction disorders*	*Arrest of disorders*
Diagnostic features	Nulliparas: >20 hr. Multiparas: >14 hr.	Nulliparas: <1.2 cm./hr. dilatation <1.0 cm./hr descent Multiparas: <1.5 cm./hr. dilatation <2.0 cm./hr. descent	Dilatation: 2 hr. arrest Descent: 1 hr. arrest
Etiological factors	Excessive sedation Unprepared cervix False labor Anesthesia Uterine dysfunction	Unknown CPD 28% Malposition Excessive sedation Anesthesia	CPD 45% Malposition Excessive sedation Anesthesia
Therapy	Rest	Support Avoid inhibitory factors	Section for CPD Oxytocin (only if no CPD)
Expected response	85% "cure" 10% out of labor	90% uninterrupted progression	94% "cure"
Delivery prognosis	Vaginal delivery	Vaginal delivery usually Section for CPD	Delivery prognosis varies with response
Fetal prognosis	No increased risk	Slightly increased risk	Threefold risk

CPD means cephalopelvic disproportion.
Section refers to cesarean section.

phase, normally greater than 1.2 cm./hr. in nulliparas and 1.5 cm./hr. in multiparas. A related disorder of descent is defined by protraction below critical limits of 1.0 cm./hr. in nulliparas and 2.0 cm./hr. in multiparas. Disorders of the deceleration phase exceed three hours in nulliparas and one hour in multiparas. A change in pattern is involved in secondary arrest of dilatation, in which there is cessation of expected progression in the active phase for at least two hours. This latter is related functionally to arrest of descent in which the progressive descent pattern is interrupted, usually in the second stage, for at least one hour.

These abnormal patterns are represented graphically in Figure 4. Each of the six disorders pictured is an independent entity and may appear in combination with any or all of the others in a given labor. Theoretically 63 permutations are possible. This suggests why so much confusion exists with regard to the clinical characterization of abnormal labor.

One may group the six abnormalities according to the functional division of labor in which they appear: 1) disorder of the preparatory division: namely, prolonged latent phase; 2) protraction disorders, including protracted active-phase dilatation and protracted pattern of descent; and 3) disorders of arrested progression, including secondary arrest of dilatation, prolonged deceleration phase, and arrest of descent. This grouping is based on certain similarities of the abnormal patterns as to etiology, response to treatment, and prognosis, as well as their propensity to occur concomitantly and sequentially during the course of a given abnormal labor. The clinical features of the three groups of labor aberrations are summarized in the accompanying table.

Patients with *prolonged latent phase*, lasting longer than 20 hours in nulliparas or 14 hours in multiparas, are frequently found to have been subjected to the inhibitory effects of excessive sedation or anesthesia. These factors appear to have been contributory to the development of prolonged latent phase in as many as 45% of the patients who have this disorder. There can be little doubt that sedation and anesthesia given too early in labor, i.e., before the latent phase is completed, will prolong labor unnecessarily. Thus it becomes imperative to recognize that the latent phase is sensitive to narcotic and analgesic medications. Second only to the influence of sedation and anesthesia is that of preparation of the cervix for labor. Patients who begin labor with the cervix unprepared—i.e., thick, uneffaced, undilated, and unyielding—can be expected to have a long latent phase during which the cervix is being prepared for subsequent active dilatation. Other patients with abnormally prolonged latent phase will later be found to have been in false labor. In these circumstances, when the contractions finally stop, the diagnosis becomes apparent retrospectively. In other cases investigation of the subsequent pattern of dilatation will reveal an abnormally slow rate of progression in the active phase, characteristic of the protraction disorders mentioned earlier. On this basis we can assume that the latent phase was probably prolonged by a similar dysfunctional process which could not be recognized during the latent phase.

Patients with prolonged latent phase are usually rather exhausted and discouraged. The foregoing studies have shown that such patients are benefitted by a significant period of rest accomplished by use of a narcotic agent such as morphine, given in sufficient amounts to stop the labor temporarily. The effectiveness of this treatment is approximately equivalent to that of oxytocin stimulation for this disorder, 85% responding subsequently with active dilatation. Rest is preferable because of the frequency of unrecognized false labor in these patients and the overriding consideration of their emotional and physical needs. No form of therapy other than rest or oxytocin has been shown to be consistently effective in correcting this disorder.

With this conservative method of treatment for prolonged latent phase by means of rest the prognosis is very good with regard to delivery and fetal outcome. As mentioned above, at least 85% of patients treated in this way respond later with normal active dilatation and descent, followed in most instances by vaginal delivery. The clinician's concern about the potentially depressing action of narcotics on the respiratory center of the infant is easily allayed. These patients do not progress to delivery while the drug is active. The depressant effects will have abated long before the infant is born. Following rest therapy, about 10% of patients will wake out of labor. In these patients we have established retrospectively the difficult differential diagnosis of false labor. In the remaining 5% thus treated, the original condition will recur in which contractions are ineffective in producing dilatation. Only in this residual group is further active therapy required. In the absence of any contraindication, oxytocin infusion can be effective in stimulating labor to terminate the latent phase and produce normal active-phase progression.

This program of management has been shown to be very useful for the treatment of patients with documented prolonged latent-phase aberrations. The choice of therapeutic rest or oxytocin stimulation is based on our desire to make the diagnostic differentiation beween false labor and the abnormal disorder of prolonged latent phase. In false labor, stimulation may increase fetal and maternal risks unnecessarily, especially since many of these patients are not prepared physiologically or functionally to have labor initiated. Amniotomy likewise has not been found to be consistently effective as a stimulatory device when the latent phase is prolonged. It is advisable, therefore, not to perform amniotomy in these cases if the membranes are still intact, because of the likelihood that the labor may prove false. Moreover, ultimate delivery may be delayed for many hours. The subsequent labor, if it does take place, may therefore be associated with ascending infection.

Prolongation of the latent phase does not influence fetal or maternal morbidity or mortality adversely, provided it is handled expeditiously when the diagnosis is made, as outlined above. There is no reason to resort to cesarean section as a primary therapy for prolonged latent phase. The prognosis for vaginal delivery is excellent and abdominal delivery is not warranted merely because the condition has been diagnosed.

Both *protraction disorders*, that is, protracted active-phase dilatation and protracted descent patterns, are analogous to each other in many ways. The underlying pathogenesis is essentially unknown, but many common factors appear to be associated or perhaps contributory. These include minor malposition, excessive sedation, and improperly administered conduction anesthesia. By the latter I mean epidural or caudal anesthetic given too high (above dermatome T-10), too early (before the onset of the active phase), or in conjunction with other inhibitory factors. Additionally, cephalopelvic disproportion is encountered in 28% of these patients. There is obvious need for definitive evaluation of fetopelvic relations by digital and x-ray examination when protraction disorders are encountered.

The treatment of these aberrations is uniformly ineffective. These rare disorders do not appear to be remediable by any of the stimulatory methods in our present clinical repertoire. At the same time, however, it is quite easy to inhibit further progress or even to produce arrest of dilatation or of descent by such potentially deleterious measures as excessive sedation or regional block anesthesia. If intractable bony dystocia is encountered in these patients, one may justifiably elect cesarean section because it avoids the necessity for long, tedious labor, which involves significant risk of ascending infection. Support is essential under these circumstances to provide for emotional and physical needs, special attention being given also to fluid and electrolyte balance. Thus it is most important for the obstetrician to recognize this abnormality so that he can provide these essential supportive measures, while taking care to avoid anything which will tend even remotely to impede progress or to jeopardize the outcome.

Continued progress should be expected if patients with protraction disorders are properly managed in a conservative manner. The prognosis remains good as long as progress continues. There appears to be only a very small increase in risk to mother or infant from these conditions, provided no ill-advised measures for stimulation or—even more important—for traumatic delivery are undertaken. Expectancy is very strongly recommended.

When the patient with a protraction disorder develops the further complication of an arrest pattern, either arrest of dilatation or arrest of descent, the outlook becomes much worse. Cesarean section now becomes more likely and fetal risks increase greatly. The risk to the fetus in association with protraction disorders is primarily related to the type of delivery utilized. Mid-forceps procedures, for example, are especially hazardous. This must be borne in mind when these critical disorders are confronted. Conservative management must be carried to its ultimate in this regard, and techniques of delivery should be limited to easy outlet forceps or spontaneous delivery.

Perhaps the most ominous cause of secondary *arrest of dilatation* or *arrest of descent* is concomitant cephalopelvic disproportion. The potential for atraumatic vaginal delivery in the presence of disproportion is negligible. Other associated factors include minor malposition, excessive sedation, and conduction anesthesia. Patients frequently present with a pattern of arrest as the first sign of disproportion. Under these circumstances the abnormal pattern of dilatation or of descent serves as a useful prognostic index. The association of bony dystocia with arrest of dilatation or descent is a significant warning. Patients who present this combination should be treated by cesarean section as the safest and the most conservative approach. Whenever arrest patterns are diagnosed, it is vital that an intensive search be carried out to uncover problems in fetopelvic relations. Since disproportion carries the worst prognosis, accurate digital and x-ray pelvimetry should be performed promptly. No form of treatment for arrest should be instituted before the pelvic relations are investigated adequately. Disproportion in association with a pattern of arrest does not deserve a further trial of labor, since vaginal delivery is very unlikely under these circumstances.

When arrest of dilatation is present, if disproportion can be ruled out, therapy can then be selected according to the condition of the patient. Where arrest has resulted from excessive sedation or from improperly administered conduction anesthesia, expectancy alone may suffice. The offending agent can be allowed to abate. Therapeutic rest is in order for patients who are thoroughly exhausted; during the rest period adequate support can be given. In the remaining patients, as well as in those who have been rested adequately but who have failed to resume progress spontaneously, stimulation with oxytocin infusion should be undertaken, if contraindications are absent. Most patients will respond well to such uterotonic stimulation as primary therapy if it is administered cautiously and in sufficient doses to simulate strong, normal labor. It must be emphasized again that no form of uterotonic stimulation should ever be instituted in these cases until the bony relations have been investigated thoroughly and disproportion has been ruled out with certainty.

Arrest of dilatation or of descent is a most serious abnormality and carries an especially poor prognosis for vaginal delivery. Many patients with these patterns ultimately require cesarean section because of disproportion. Where pelvic relations are adequate, the prognostic outlook for vaginal delivery is much better. One can determine the prognosis more carefully by means of a therapeutic trial if one compares the rate of progression in the slope of dilatation or descent before the arrest with the rate that occurs after treatment for the arrest. The prognosis for delivery improves with the increment of slope. The more rapid the postarrest slope, the more likely is vaginal delivery. Patients whose postarrest slope is more than 2 cm./hr. greater than the prearrest slope should all be expected to deliver vaginally. None should require cesarean section—unless it is indicated for some other reason, such as fetal distress. The clinician should bear in mind, however, that this test of stimulation should not be undertaken in the presence of documented disproportion.

As regards fetal prognosis, the specific risk factor for arrest patterns appears to be greater than that which is expected for comparable normal labors.[3] This holds even when the specific delivery hazards, such as accrue to midforceps procedure, for example, are taken into account. On this basis, arrest of dilatation or descent must be considered to be a pattern of labor that is inherently deleterious to the fetus. Therefore it requires early diagnosis, prompt evaluation for disproportion, and careful, definitive, and conservative management. Since most arrest patterns are easily diagnosed within a short time after cessation of progression in dilatation or descent, it should be relatively easy to uncover these high-risk situations expediently. This applies especially to clinicians who graph the progress of ongoing labor. If one were to wait for some arbitrary total duration of labor to pass before becoming aware of the possible presence of abnormalities, one would regularly miss patterns of arrest until it was perhaps too late to correct them or to avert serious fetal damage.

We have reviewed the standards of clinical definition of aberrant labor as defined by simplified techniques of analyzing the graphic patterns of dilatation and descent as they relate to the time elapsed in labor. Approaching these functions from a mechanistic point of view, we have evolved objective criteria for diagnosis of specific labor aberrations, clarifying some of the confusion that pervades this field. We have characterized the six major aberrations of labor that become readily apparent by this approach, grouping them into three major categories according to the functional division of labor in which they arise. We have detailed relevant data concerning etiologic factors, efficacy of modalities of treatment, and prognostic outlook for these disorders. Programs of management have been devised for each group of dysfunctional patterns based on these data. The introduction of the graphic analytic technique of analysis of labor appears to have added a significant new dimension to our diagnostic potential and therapeutic capabilities. Its value to the practicing clinician has been clearly demonstrated.

REFERENCES

1. Friedman, E. A.: Labor: Clinical Evaluation and Management. New York, Appleton-Century-Crofts, 1967.
2. Friedman, E. A.: Functional divisions of labor. *Amer. J. Obstet. Gynec. 109:* 274-80, 1971.
3. Friedman, E. A. and Sachtleben, M. R.: High risk labor. *J. Reprod. Med. 7:* 28-32, 1971.